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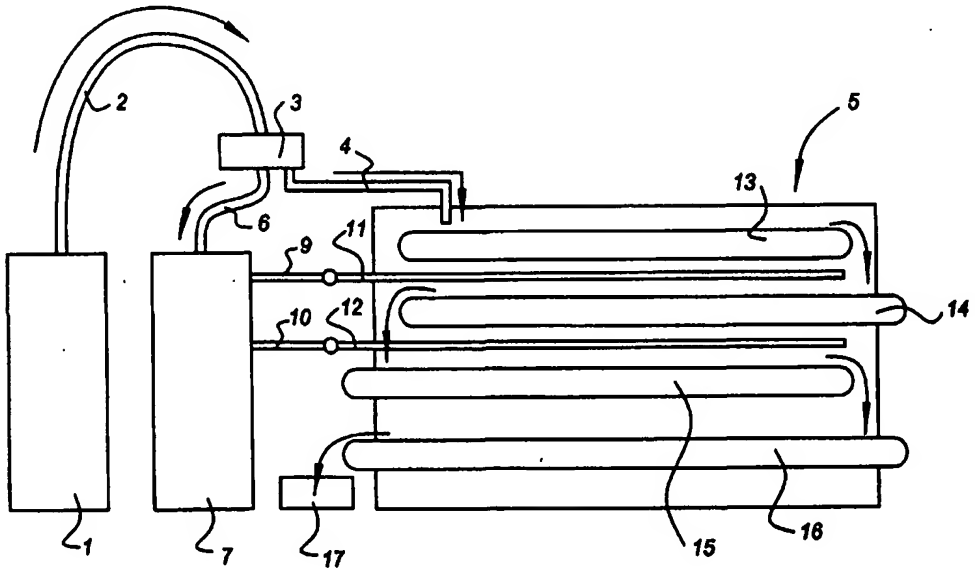


(57) Abstract

The invention relates to a method for drying manure, comprising the following successive steps: a) separating the manure into a liquid fraction and a more solid fraction which contains more dry matter than the manure prior to separation; b) drying the more solid fraction obtained to form a dried, more solid fraction; c) moistening the previously obtained dried, more solid fraction with liquid containing urine and possibly faeces, and then drying this moistened, dried, more solid fraction again to form a dried, more solid fraction. The invention furthermore relates to a device for carrying out the method. This device comprises in particular a plurality of conveyor belts which are stacked above one another, convey in opposite directions and may be air–permeable in order to assist with air drying.

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Method for drying manure and device for carrying out this method

The invention relates to a method for drying manure, in particular manure containing less than approximately 15% by weight dry matter (also known as dry substance).

The drying of manure is known, for example, from WO-97/49961. This publication relates to the drying of manure, in particular chicken manure, which in the untreated/undried initial state generally contains from 20 to 25% by weight dry matter. A manure of this nature is already relatively solid in the initial state and can then be dried on an airpermeable base by air drying if forced by air driven through the base and the manure from below. However, such a way of drying manure is less suitable for drying more liquid manures, such as cow manure and pig manure, which generally contain from 3 to 12% by weight dry matter. In the prior art, this problem is overcome by firstly separating such liquid manures into a liquid fraction, which largely comprises urine, and a more solid fraction. These fractions are then treated/processed/ dried separately.

The object of the present invention is to provide an improved method for drying manure.

According to the invention, this object is achieved by providing a method for drying manure, in particular manure containing less than approximately 15% by weight dry matter, comprising the following successive steps:

a) separating the manure into a liquid fraction and a more solid fraction which contains more dry matter than the manure prior to separation,

b) drying the more solid fraction preferably obtained in step a) to form a dried, more solid fraction,

c) moistening the previously obtained dried, more solid fraction with liquid containing urine and possibly faeces, such as the liquid from the liquid fraction preferably obtained in step a), and then drying this moistened, dried, more solid fraction again to form a dried, more solid fraction.

The result is a dried manure comprising one end product instead of two. It is then only necessary to discharge or treat in some other way one end product, namely the dried, more solid fraction which ultimately results. The liquid fraction may in this case be fed to the dried, more solid fraction without being treated, although it is also conceivable

for the liquid fraction to be pretreated, for example filtered, before it is fed to the dried, more solid fraction. When step c) is carried out, faeces residues which are present in the liquid fraction are left in the dried, more solid fraction, and the water which is present in the liquid fraction is evaporated during the drying, and can be discharged to the environment. In order, on the one hand, to ensure that all the separated liquid fraction is fed back to the more solid fraction for moistening and, on the other hand, to prevent the more solid fraction from being moistened to such an extent that it becomes liquid, in the sense that the dry matter content is too low, it is advantageous according to the invention if step c) is repeated one or more times.

The method according to the invention makes it possible in particular to substantially reduce the ammonia emissions. In stalls, faeces and urine are collected together as manure. The problem with this is that the urine and faeces together produce a chemical reaction which releases ammonia. A certain time, in the region of 2 hours, is required for this reaction to commence. By separating the solid faeces from the liquid urine in the manure receptacle, for example by settling, it is possible to counteract the ammonia emissions. With the method according to the invention, it is then possible to dispose of the liquid fraction by distributing it in steps over the dried, more solid fraction and then subjecting this matter to a drying process again, etc. The rate of the drying process is such that the ammonia emission remains suppressed.

In order to ensure that it is not possible for an excessively wet, more solid fraction to remain at the end of the method, it is advantageous according to the invention if after the final step c) the dried end product from this final step c) is subjected to further drying in a step d).

According to the invention, the separation of step a) can be carried out by subjecting the manure, i.e. the relatively liquid starting manure, to a pressing process. However, other separating techniques, such as settling, centrifuging techniques or drum screen techniques can also be used to good effect.

In order to make the more solid fraction obtained in step a) suitable for drying, it is advantageous according to the invention if it contains at least approximately 15% by weight, preferably at least 20% by weight, more preferably from at least 25 to 30% by weight, dry matter.

According to an advantageous embodiment of the invention, an absorbent material is added to the more solid fraction prior to or during step b), for example by

mixing the more solid fraction with the absorbent material. By adding an absorbent material, it is possible, as it were, to make the more solid fraction drier, so that the drying time required becomes, as it were, shorter. A further advantage is that after an absorbent material has been added, the volume of liquid which can be added to the dried, more solid fraction in a step c) is greater, i.e. the liquid-absorption capacity of the dried, more solid fraction increases. The reason why the drying time is reduced is that the liquid can be evaporated more quickly form the absorbent material than from the more solid manure fraction itself. According to the invention, it is particularly advantageous if the absorbent material is a cellulose-based material, such as paper, peat, woodchips, hay, straw or grass. The advantage of a cellulose-based absorption material of this nature is that the end product obtained after drying, which therefore also contains the cellulose-based absorbent material, can be driven over the land or spread as manure together with the cellulose-based absorbent material. The cellulose-based absorbent material is relatively harmless to the environment and can be spread over crops without problems.

In order to ensure that the substance obtained during the moistening in step c) is not excessively liquid, it is advantageous according to the invention if the drying in step b) and/or the drying in a preceding step c) is carried out in such a manner that a dried, more solid fraction which acts as a sponge is obtained.

According to the invention, the drying in step b) and/or the drying in step c) and/or the drying in step d) can advantageously be carried out by guiding air along and/or over and/or through the manure mass to be dried, i.e. the more solid fraction, which may have been moistened, to be dried. The air which is guided along and/or over and/or through the manure mass to be dried will in this case preferably be at a temperature of at least 10°C or will be/have been heated to a temperature of at least 10°C, and/or the relative humidity of this air will preferably be less than 80%, more preferably less than 50%.

According to the invention, the moistening in step c) can advantageously be achieved by sprinkling the previously obtained dried, more solid fraction with liquid from the liquid fraction.

In addition or as an alternative, the moistening in step c) may also be carried out by spraying liquid from the liquid fraction into the previously obtained, dried, more solid fraction. The advantage of spraying the liquid in is that this takes

place inside the manure mass and that there is no obstacle presented by a crust of dry, hard manure which has formed, in the sense that this crust impedes absorption of the liquid which is administered.

With regard to the moistening, it is conceivable for the way in which this takes place to be varied for each step c) or to be varied depending on the extent to which the drying process has progressed.

According to a further aspect, the invention relates to a device for carrying out the method according to the invention, which device comprises:

- a separating device, such as a press or centrifuge or drum screen,
- a drying device,
- a spraying device arranged in the region of the drying device,
- a liquid-discharge system, the inlet of which is connected to the separating device in order to receive separated liquid fraction and the outlet of which is connected to the spraying device,
- a manure-discharge system, the inlet of which is connected to the separating device in order to receive separated more solid fraction, and the outlet of which is connected to the drying device in order to deliver separated, more solid fraction.

According to the invention, the drying device may be designed in many ways. Preferably, the drying device comprises at least one conveyor belt, on which the mass to be dried can be placed, which conveyor belt is preferably air-permeable, so that the air can be driven through the mass to be dried from below.

In the device according to the invention, the drying device may advantageously also comprise a plurality of conveyor belts which are effectively connected to one another in the conveying direction and are preferably of air-permeable design. Conveyor belts of this nature can then be arranged in a space-saving manner and may, if appropriate, be operated and driven independently of one another.

According to a particularly space-saving embodiment which acts in a particularly efficient manner, the plurality of conveyor belts are arranged above one another, and the discharge side of each previous conveyor belt always discharges on to the entry side of the following conveyor belt, preferably by the entry side of the said following conveyor belt projecting beyond the discharge side of the said previous

conveyor belt, and the said previous and the said following conveyor belt are designed to each convey in opposite directions. Preferably, the uppermost of the plurality of conveyor belts will then be the first conveyor belt as seen in the conveying direction, and the lowermost of the plurality of conveyor belts will be the last conveyor belt, as seen in the conveying direction, the outlet of the manure-discharge system opening out in the vicinity of the entry side of the uppermost conveyor belt.

In the device according to the invention, it is particularly advantageous for the drying device used to be the "multi-level drying system for drying animal manure", as disclosed in WO-97/49961, which with regard to this "multi-level drying system" is incorporated by reference in this application in its entirety; in this context, reference may be made in particular to the drying device and drying method as described in the claims of the said application, but also to the entire description of the said PCT application.

According to a further advantageous embodiment, the intermediate conveyor belts which lie between the uppermost and lowermost conveyor belts will be provided with a spray nozzle, which is connected to the spraying device, for spraying liquid fraction. No spraying is required for the uppermost conveyor belt, since the drier fraction which is present on this conveyor belt has to be dried before it can absorb liquid fraction. If appropriate, a spray nozzle for spraying liquid fraction could be arranged at the end, i.e. at the discharge side, of the uppermost conveyor belt.

The spray nozzle may according to the invention be arranged at or in the vicinity of the entry side of the respective conveyor belt or may extend along or over the respective conveyor belt in the longitudinal direction. In the case of so-called continuous operation, it will generally be chosen to arrange a spray nozzle at or in the vicinity of the entry side of the respective conveyor belt, so that spraying takes place at the beginning of the conveyor belt and drying can be carried out during further conveying. It is also conceivable for the conveyor belts each to be advanced periodically, in order firstly to be entirely covered with a dried, more solid fraction, then to be entirely sprayed with liquid fraction, and then to be dried again to give a dried, more solid fraction. Particularly with regard to the treatment capacity, a relatively large conveyor belt surface is then required, and this can be achieved in a space-saving manner in particular with the stacked configuration which is known from WO-97/49961.

According to a further advantageous embodiment of the invention, the liquid-discharge system will have a storage container for liquid fraction, in order to prevent the liquid fraction instantaneously obtained having to be immediately distributed over relatively drier, more solid fraction without the possibility of it being stored for an interim period.

The present invention will now be explained in more detail with reference to an exemplary embodiment which is diagrammatically depicted in a drawing, in which:

Figure 1 shows a highly diagrammatic representation of the method and device according to the invention; and

Figure 2 shows a diagrammatic cross-sectional view through one of the conveyor belt systems of the drying device.

In Figure 1, 1 diagrammatically depicts a container for storing the starting manure. This container 1 is connected to a press 3 by means of a line 2. Via the line 2, the manure can be fed out of the container 1 to the press 3. The press 3 is provided with a discharge 4 for more solid fraction to be discharged to the drying device 5 and a discharge line 6 for discharging liquid fraction to a storage container 7. Lines 9 and 10, to which spray pipes 11 and 12 are connected, are connected to the storage container 7 for liquid fraction. The drying device 5 comprises a plurality of endless conveyor belts which are positioned above one another; in the example illustrated there are four conveyor belts, namely 13, 14, 15 and 16. Conveyor belt 13 moves in the clockwise direction, conveyor belt 14 moves anticlockwise, conveyor belt 15 moves clockwise and conveyor belt 16 moves anticlockwise. The entry side of conveyor belt 14 projects beyond the discharge side of conveyor belt 13. The entry side of conveyor belt 15 projects beyond the discharge side of conveyor belt 14. The entry side of conveyor belt 16 projects beyond conveyor belt 15. The result is that mass or matter which has been placed on conveyor belt 13 at the entry side of conveyor belt 13 can be conveyed, via successive conveyor belts 13, 14, 15 and 16, to the discharge side of conveyor belt 16 and, from the discharge side of conveyor belt 16, can be discharged into a final storage container 17.

The spray pipes 11 and 12 extend in the longitudinal direction of conveyor belt 14 and 15, respectively, and are designed in such a manner that they are able to spray liquid over the conveyor belt lying beneath them over substantially the entire

length of the respective conveyor belt and preferably also over the entire width. It will be clear that it is also possible to provide a plurality of spray pipes for each conveyor belt within the scope of the invention. For example, a spray pipe which is directed to spray inwards may be provided along each longitudinal side.

The system according to the exemplary embodiment sketched above operates as follows:

Manure which is to be dried, also referred to as starting manure, is situated in a storage container 1 or is fed to this storage container 1. This manure may, for example, be pig or cow manure and may contain less than approximately 12% by weight and generally (although not necessarily always) more than approximately 3% by weight dry matter. Via line 2, the manure is fed from the storage container 1 to the press 3. In the press 3, the starting manure which has been fed to this press is separated by pressing into a liquid fraction which essentially contains urine, but possibly also faeces residues, and a more solid fraction containing dry matter, in such a manner that this more solid fraction has a consistency which is sufficient for it to be sprayed over the conveyor belt 13 via discharge 4. A dry matter content of at least approximately 20% by weight, preferably at least approximately 25 to 30% by weight, generally ensures that the more solid fraction has a sufficient consistency.

If appropriate, the more solid fraction which comes out of the separating device or press 3 may also be guided through a pelletizing device before it is fed to the conveyor belt 13. This makes it possible to achieve a granular, pellet-containing manure which contains 50 to 60% by weight dry matter and can be distributed over the conveyor belt 13 for further treatment.

The more solid fraction may be distributed over the conveyor belt 13 during the pressing, while gradually more solid fraction flows out of discharge 4, by advancing conveyor belt 13 in the clockwise direction, thus distributing, preferably uniformly, the more solid fraction over the conveyor belt 13. This advance will be stopped as soon as the front of the more solid fraction approaches the discharge side of the conveyor belt 13.

During pressing, liquid fraction will also be released, which is discharged via line 6 to a storage container 7.

When conveyor belt 13, or at least its top side, is completely or sufficiently covered with the more solid fraction, this more solid fraction will be subjected to a

drying process, the so-called method step b) from the claims. This drying can be carried out by guiding air along the drier fraction on the conveyor belt 13. Preferably, however, the conveyor belt 13 will be of perforated or air-permeable design, in order to be able also to guide the air through the top part of the conveyor belt 13 in the upwards direction from below, and therefore also through the more solid fraction which lies on the conveyor belt 13.

When the more solid fraction lying on the conveyor belt 13 has been dried to a sufficient extent, in particular has been dried to such an extent that it acts as a sponge with regard to liquid which is to be fed to the dried, more solid fraction, the conveyor belt 13 will be set in motion, in order to feed the dried, more solid fraction which is present thereon to the conveyor belt 14 lying beneath it, which will be moving at the same time, but in the anticlockwise direction, in order for dried, drier fraction to be distributed over it. When the top part of the conveyor belt 14 is covered with the dried, more solid fraction, which was previously lying on the top part of conveyor belt 13, liquid fraction from storage container 7 will be sprayed via spray pipe 11 over the previously dried, more solid fraction, for example until the dry matter content is again approximately equal to the dry matter content of the more solid fraction when it leaves the press 3. Then, the sprayed, more solid fraction lying on the top part of the conveyor belt 14 will be dried again, preferably in the same way as the earlier drying on the top part of conveyor belt 13.

Moistening the dried, more solid fraction on conveyor belt 14 and drying it again represents the method step c), in particular the first method step c) of a series of repetitions of this step, from the claims.

When the more solid fraction on conveyor belt 14 has again been dried to a sufficient extent, preferably when its dry matter content is again approximately equal to the dry matter content of the more solid fraction when it leaves the press, conveyor belt 14 is again set in motion, in order to convey the dried, more solid fraction onwards to conveyor belt 15, where it is to be moistened by a spray pipe 12 and dried again, in a corresponding manner to the procedure described above for conveying from conveyor belt 13 to conveyor belt 14 and moistening and drying again on conveyor belt 14. Then, on conveyor belt 15, method step c) from the claims is repeated for the second time. Method step c) can thus be repeated a number of further times, depending on the amount of liquid fraction and the absorption capacity of the dried, more solid fraction.

Finally, when the last method step c) has been carried out, the dried, more solid fraction is fed from conveyor belt 15, or if appropriate a further corresponding conveyor belt, to the last conveyor belt, in this case conveyor belt 16, in order to be distributed over this conveyor belt 16 and dried further in the manner described above, preferably in accordance with the method of drying as explained with reference to conveyor belt 13 and conveyor belts 14 and 15. The aim of this further drying on conveyor belt 16 is to dry the more solid fraction still further, possibly even to such an extent that the spongy action is lost again. When sufficient drying has taken place on the conveyor belt 16, the resulting dried product is discharged to a collection container 17. It is thus possible to obtain a dried end product which easily contains 80 to 90% by weight, and possibly even more, dry matter.

It will be clear that the above process, which has been described as a discontinuous, stepwise process, can also be carried out continuously. In this case, the conveyor belts 13, 14, 15 and 16 will convey at a defined, constant speed, and the moistening will then take place at in each case the feed side of conveyor belts 14 and 15 and/or, if appropriate, the discharge side of conveyor belts 13 and 14.

If appropriate, drying may take place in an essentially closed space, so that the air used for drying can be guided through an air scrubber of a type which is known per se, in order, for example, for substances/constituents which pollute the environment and have been taken up from the manure to be removed from this air.

In the case of the discontinuous, stepwise process, the manure may be transported from one conveyor belt to the next conveyor belt at intervals of, for example, 4 to 6 hours, so that on the basis of four conveyor belts positioned above one another the manure can be dried to form the dried end product in approximately 24 hours.

By way of more detailed example, Figure 2 shows a diagrammatic cross-sectional view of conveyor belt 15. In Figure 2, 21 denotes the bottom part of the conveyor belt, 20 denotes the top part of the conveyor belt and 22 denotes side walls which, together with the top part 20 and bottom part 21, enclose a chamber via which air can be supplied, which air is guided through the manure 24 lying above the top part 20 via perforations in the said top part 20. A V-shaped receptacle 23, which extends in the longitudinal direction of the conveyor belt, is arranged in the chamber which is delimited between the side walls 22, the top part 20 and the bottom part 21: The object

of this V-shaped receptacle is to make it possible to collect and discharge any moisture which seeps through the top part 20.

Furthermore, Figure 2 shows two ways in which liquid from the liquid fraction can be sprayed into the manure 24 lying on the top part 20. These two ways may be used in combination or instead of one another. The first way in which the liquid can be sprayed into the manure 24 is by arranging one or more drainage pipes 25, which preferably extend in the longitudinal direction of the top part 20, just above the top part 20, within the layer thickness of manure 24 which is to be formed on the top part 20. These drainage pipes 25, one of which is shown, can then spray the liquid from the liquid fraction into the manure mass 24 and, like the spray pipes 11 and 12, will be connected to the storage vessel 7. Another possibility for spraying liquid from the liquid fraction into the manure layer 24 is to use one or more spray nozzles 27 which can move up and down in the vertical direction and if appropriate may all be mounted on a common feed pipe 26, which may then extend, for example, in the longitudinal direction of the conveyor belt 15.

The conveyor belt 15, in particular its top part 20, may if appropriate be arranged in the form of a V-shaped trough (similar to the V-shaped form of the receptacle 23). This may be advantageous in connection with the use of a so-called drainage pipe 25, but also in connection with the use of injection nozzles 27 which may be optionally moved up and down in the vertical direction.

The method and device according to the invention can be used at/close to the stall in which the animals are kept. Generally, the device for carrying out the method will preferably be positioned in an outbuilding or in a room which is separate from the stall room itself.

## Claims

1. Method for drying manure, in particular manure containing less than approximately 15% by weight dry matter, comprising the following successive steps:

a) separating the manure into a liquid fraction and a more solid fraction which contains more dry matter than the manure prior to separation,

b) drying the more solid fraction obtained in step a) to form a dried, more solid fraction,

c) moistening the previously obtained dried, more solid fraction with liquid containing urine and possibly faeces, such as the liquid from the liquid fraction obtained in step a), and then drying this moistened, dried, more solid fraction again to form a dried, more solid fraction.

2. Method according to Claim 1, in which step c) is repeated one or more times.

3. Method according to Claim 1 or 2, in which after the final step c) the dried end product from this final step c) is subjected to further drying in a step d).

4. Method according to one or more of the preceding claims, in which the separation of step a) is carried out by subjecting the manure to a pressing process.

5. Method according to Claim 4, in which the more solid fraction obtained in step a) contains at least approximately 20% by weight, preferably from at least 25 to 30% by weight, dry matter.

6. Method according to one or more of the preceding claims, in which an absorbent material is added to the more solid fraction prior to or during step b), for example by mixing the more solid fraction with the absorbent material.

7. Method according to Claim 6, in which the absorbent material is a cellulose-based material, such as paper, peat, woodchips, hay, straw or grass.

8. Method according to one or more of the preceding claims, in which the drying in step b) is carried out in such a manner that a dried, more solid fraction which acts as a sponge is obtained.

9. Method according to one or more of the preceding claims, in which the drying in step c), at least until the final step c), is carried out in such a manner that a dried, more solid fraction which acts as a sponge is obtained.

10. Method according to one or more of the preceding claims, in which the drying in step b) and/or the drying in step c) and/or the drying in step d) is carried out by guiding air along and/or over and/or through the manure mass which is to be dried.

11. Method according to Claim 10, in which the air which is to be guided along and/or over and/or through the manure mass to be dried is at a temperature of at least 10°C or is heated to a temperature of at least 10°C.

12. Method according to Claim 10 or 11, in which the air to be guided along and/or over and/or through the manure mass to be dried has a relative humidity of less than 80%, preferably less than 50%.

13. Method according to one of the preceding claims, in which the moistening in step c) is carried out by sprinkling the previously obtained dried, more solid fraction with liquid from the liquid fraction.

14. Method according to one of the preceding claims, in which the moistening in one or more of the steps c) is carried out by spraying liquid from the liquid fraction into the previously obtained dried, more solid fraction.

15. Device for carrying out the method according to one or more of the preceding claims, comprising:

- a separating device, such as a press or centrifuge,
- a drying device,
- a spraying device arranged in the region of the drying device,
- a liquid-discharge system, the inlet of which is connected to the separating device in order to receive separated liquid fraction and the outlet of which is connected to the spraying device,
- a manure-discharge system, the inlet of which is connected to the separating device in order to receive separated more solid fraction, and the outlet of which is connected to the drying device in order to deliver separated, more solid fraction.

16. Device according to Claim 15, in which the drying device comprises at least one conveyor belt which is preferably air-permeable.

17. Device according to Claim 15 or 16, in which the drying device comprises a plurality of conveyor belts which are effectively connected to one another in the conveying direction and are preferably air-permeable.

18. Device according to Claim 17, in which the plurality of conveyor belts are arranged above one another, and in which the discharge side of each previous conveyor belt always discharges on to the entry side of the following conveyor belt, preferably by the entry side of the said following conveyor belt projecting beyond the discharge side of the said previous conveyor belt, and in which the said previous and the said following conveyor belt are designed to each convey in opposite directions.

19. Device according to Claim 18, in which the uppermost of the plurality of conveyor belts is the first conveyor belt, as seen in the conveying direction, in which the lowermost of the multiplicity of conveyor belts is the last conveyor belt, as seen in the conveying direction, and in which the outlet of the manure-discharge system opens out in the vicinity of the entry side of the uppermost conveyor belt.

20. Device according to Claim 19, in which the intermediate conveyor belts which lie between the uppermost and lowermost conveyor belts are provided with a spray nozzle which is connected to the spraying device.

21. Device according to Claim 20, in which the spray nozzle is arranged on or in the vicinity of the entry side of the respective conveyor belt or extends along or over the respective conveyor belt in the longitudinal direction.

22. Device according to one or more of Claims 15-21, in which the liquid-discharge system has a storage container for liquid fraction.

Fig 1

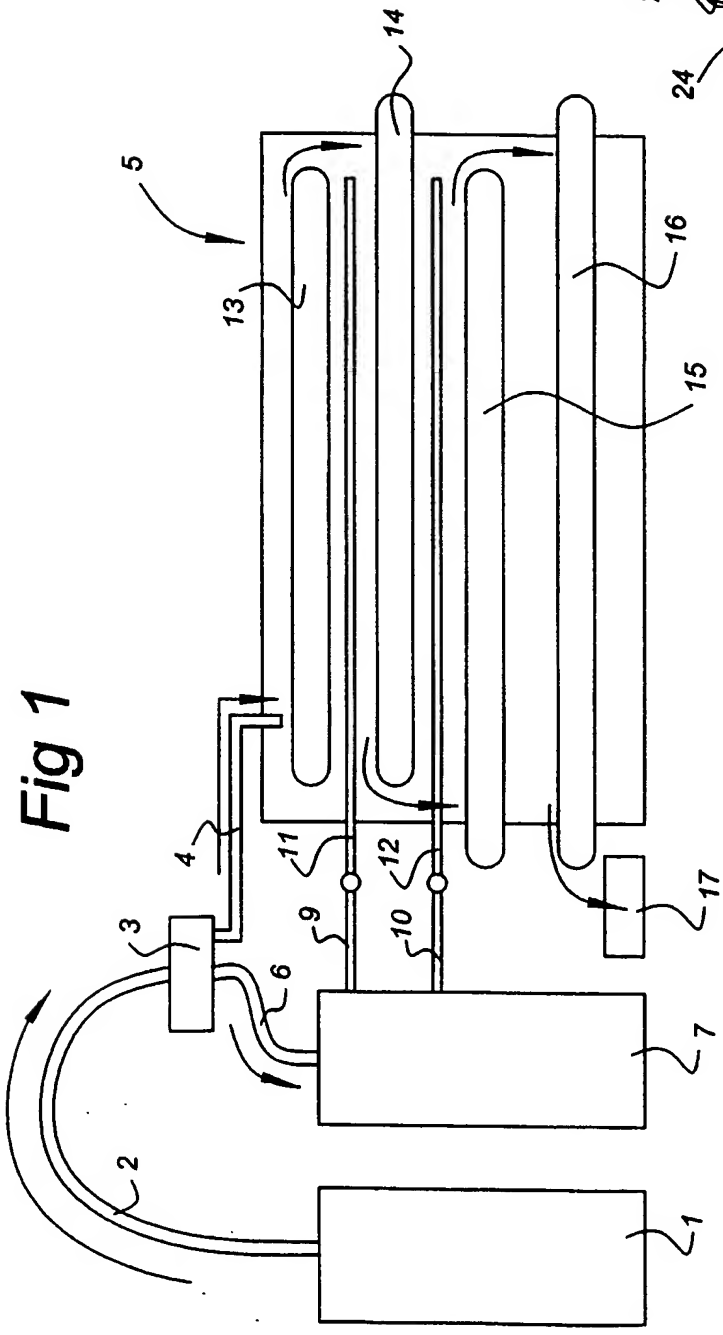
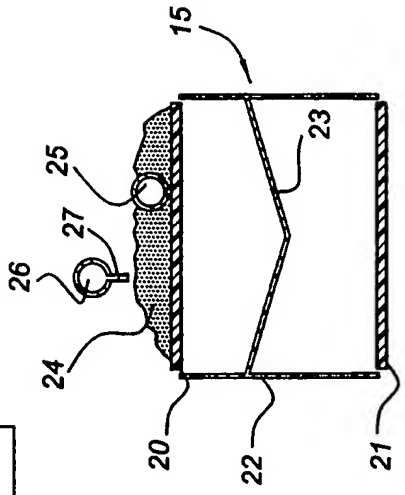



Fig 2



# INTERNATIONAL SEARCH REPORT

Inte onal Application No
PCT/NL 99/00257

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 F26B7/00 F26B17/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 F26B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| A | WO 96 12923 A (DUSS FRANZ)<br>2 May 1996 (1996-05-02)<br>the whole document | 1,4,10,<br>13,<br>15-19,22 |
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-/--

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 5 July 1999 | 12/07/1999 |

| Name and mailing address of the ISA | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,<br>Fax: (+31-70) 340-3016 | Silvis, H |

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# INTERNATIONAL SEARCH REPORT

Intr ional Application No
PCT/NL 99/00257

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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| A | WO 97 49961 A (BRUIN PETRUS JOHANNES HENRICUS) 31 December 1997 (1997-12-31) cited in the application the whole document | 16-19 |
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